ENGINEERING PORTFOLIO

ARYONN RAWOL

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0451 345 110

Hello, I'm a Mechanical Engineering and Mathematics undergrad at the University of Sydney, and I'm looking to make the jump from academia to industry.

I am confident in my ability to create accurate and detailed plans and technical drawings for a wide range of engineering projects. I have a proven track record of using a variety of software and tools, such as SolidWorks and ANSYS, to bring my ideas to life. All images in this portfolio are my own work, and showcase my engineering design prowess.

In addition to my technical skills, I am a highly detail-oriented and organized individual, with the ability to effectively manage multiple projects at once. I am always looking for ways to improve my skills and stay up-to-date with the latest technologies and techniques in the field.

I am excited to bring my abilities to your company and am confident that my skills and experience make me an asset to your team. I am eager to learn and grow as an engineer, and I am committed to delivering high-quality work on every project.

RESUME

EXPERIENCE

CMY CUBES | DESIGN CONSULTANT

July 2022 – Current

- Oversaw the design of new products from concept to manufacturing
- Implemented the use of new manufacturing techniques
- Helped maintain extensive documentation of design process

USYD RESEARCH INTERNSHIP | RESEARCHER

October 2021 – February 2022

- Created a new nozzle design using input from existing research
- Performed laboratory tests and analysed data for verification
- Iterated nozzle design based on laboratory testing and CFD simulations

CHASSISSIM TECHNOLOGIES | DATA ANALYST

January 2021 – June 2021

- Created simulation vehicle dynamics and tyre models to suit clients' needs
- Validated models against real world test data and clients' specifications
- Developed and tested a driver simulation model for rapid iteration data

USYD MOTORSPORT | AERODYNAMICS TEAM

January 2019 – June 2023

- Helped design a full aerodynamic package for the 2021 USYD FSAE vehicle
- Connected with industry professionals for sponsorships and manufacturing advice
- Ran simulation and real world data to inform refinements through iteration

USYD ROCKETRY | AEROSTRUCTURES TEAM

June 2019 – January 2023

- Produced, updated and maintained a model and parts database to ensure strict version control
- Created drawings to industry standards for external manufacturing
- Liaised between various sub-teams to optimise a range of design requirements

EDUCATION

BACHELOR OF MECHANICAL ENGINEERING (SPACE) (HONOURS) AND BACHELOR OF SCIENCE (MATHEMATICS) | DISTINCTION AVERAGE

January 2019 - June 2024 — University of Sydney

TECHNICAL EXPERTISE

- Solidworks
- Onshape
- Autodesk Inventor
- ANSYS
- MoTeC i2
- Machining
- 3D Printing
- Composites Manufacturing
- Python
- C
- RStudio
- MATLAB
- Mathematica
- Microsoft Office

OVERVIEW

1. MARINE CLOUD BRIGHTENING NOZZLE | UNIVERSITY OF SYDNEY RESEARCH PROJECT
2. AERODYNAMICS PACKAGE DEVELOPMENT | UNIVERSITY OF SYDNEY FSAE MOTORSPORT
3. FUEL TANK DESIGN | UNIVERSITY OF SYDNEY MOTORSPORT
4. NOSECONE DESIGN | UNIVERSITY OF SYDNEY ROCKETRY
5. FIN LOCATOR DESIGN | UNIVERSITY OF SYDNEY ROCKETRY

MARINE CLOUD BRIGHTENING NOZZLE

CONCEPT

Coral reefs are suffering from the effects of global warming, which is causing sea surface temperatures to rise and making it more difficult for coral to survive. One of the most significant impacts of global warming on coral reefs is bleaching, which occurs when coral becomes stressed due to an increase in water temperature, turning white. Marine cloud brightening is a proposed method of geoengineering that aims to mitigate the effects of global warming by increasing the reflectivity of clouds over the oceans. This could be done by injecting fine particles of seawater into the atmosphere to form clouds, reflecting more sunlight back into space and cooling the Earth's surface.

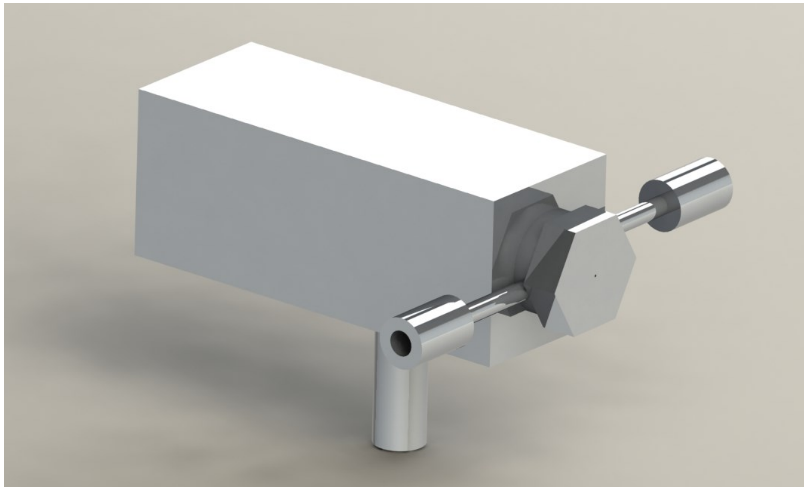


IMAGE BY ARYONN RAWOL

AIM

The aim of the research project I worked on is to create a nozzle which can inject seawater at an appropriate level of atomization and flow rate, in order to facilitate production of cooling clouds. These design specifications are to be balanced with the lightness and robustness, as well as ease of manufacture, required for a design that will be sent in geographically significant quantities to the middle of the ocean.

The internal profile, which is displayed on the next page, is carefully to form a high volume of droplets of an average size of 6 µm, the ideal diameter for cloud nucleation, while minimising the standard deviation from this size to reduce inefficiencies. The multi-part screw design allows for easy manufacturing of the complex profile, as well as allowing for swappability during testing. Stainless steel was selected for use in the prototype parts due to its corrosion resistance against salt water, but large scale production will likely use high carbon steel.

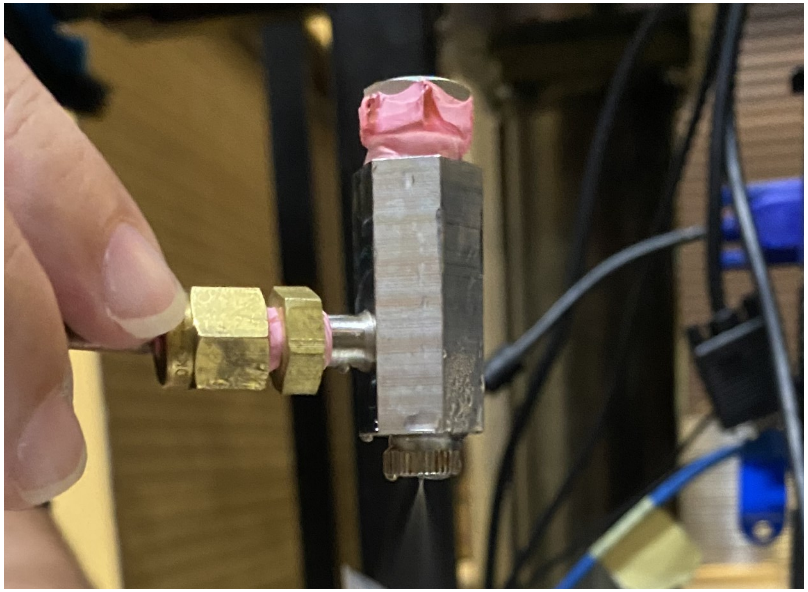
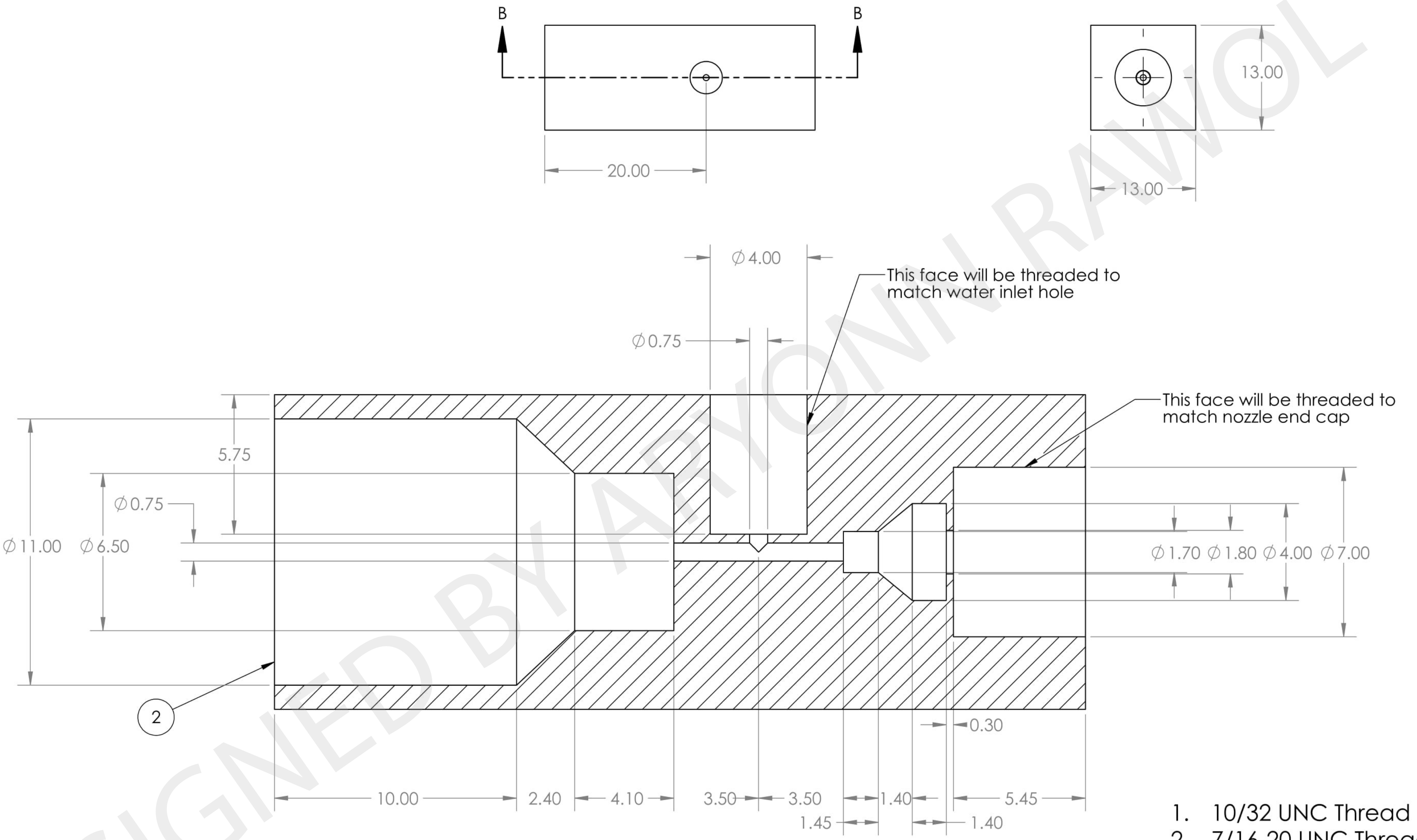


IMAGE BY ARYONN RAWOL



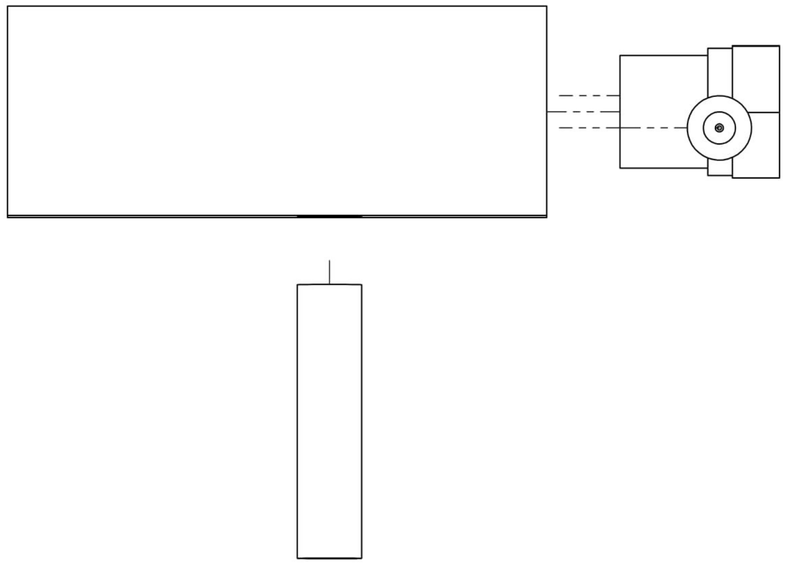
SECTION B-B
SCALE 6 : 1

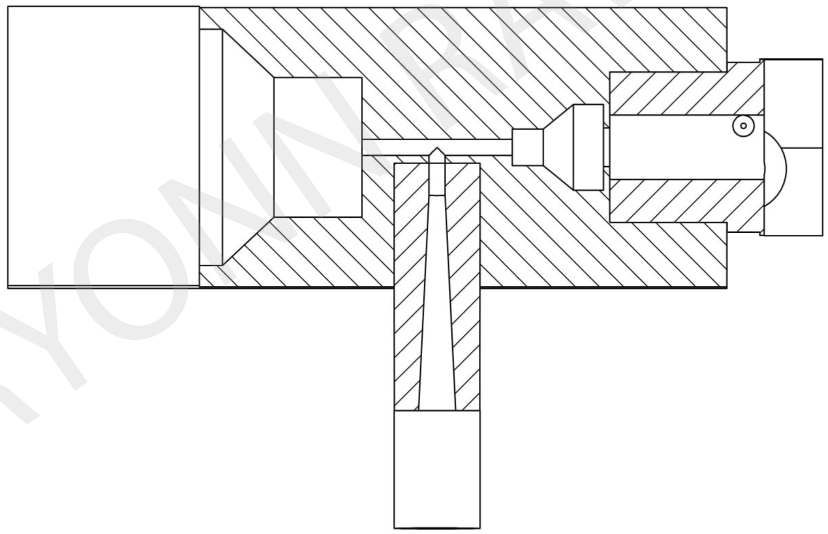
1. 10/32 UNC Thread
2. 7/16-20 UNC Thread

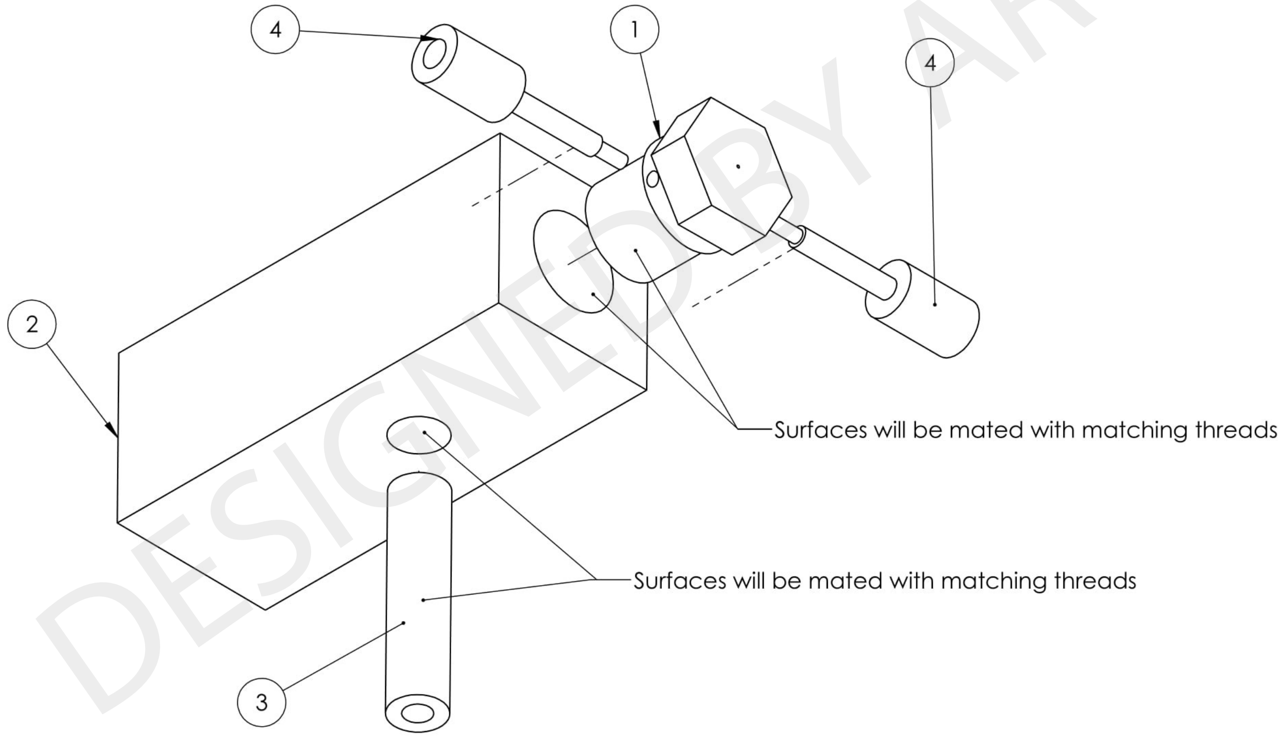
DO NOT SCALE DRAWING	REVISION
ARYONN RAWOL	
TITLE: Nozzle Flat Endcap Internal	
MATERIAL:	DWG NO.	A3
DATE	SCALE:2:1	SHEET 1 OF 1

NOTE: Internal fillet radii dimensions to be discussed with workshop prior to fabrication

DESIGNED BY ARYONN RAWOL







NO.	PART NUMBER	QTY.
1	Swirl Compatible EndCap	1
2	Nozzle Flat Endcap	1
3	Water Inlet 0.75 mm Exit	1
4	EndCap Swirl Fitting	2

DO NOT SCALE DRAWING	REVISION
ARYONN RAWOL	
TITLE: Adjustable Nozzle Assembly	
DATE:	A3
SCALE:4:1	SHEET 1 OF 1

DESIGNED BY ARYONN RAWOL

AERODYNAMICS PACKAGE DEVELOPMENT

CONCEPT

The Formula SAE project is a student design competition in which teams design, build, and test small formula-style race cars. The competition includes evaluations of the car's performance, design, manufacturing and a comprehensive business plan.

Aerodynamics plays a significant role in the performance of the SAE vehicle due to its small size, and low power. It affects the car's grip, stability, and overall speed by influencing the flow of air around the vehicle. Proper aerodynamic design can improve a car's handling and reduce drag, allowing it to go faster and handle better on the track, a key aspect of the design competition.

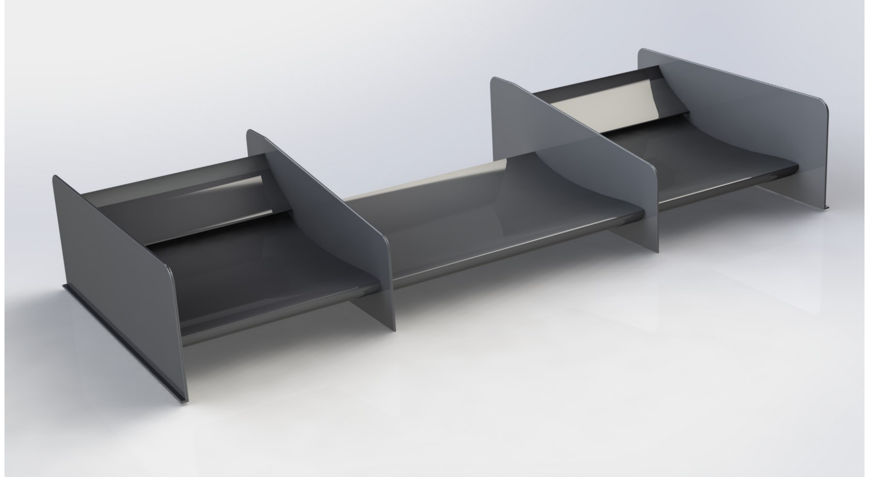


IMAGE BY ARYONN RAWOL

AIM

The task was to produce an aerodynamics package for the 2021 University of Sydney FSAE vehicle. The package had to be robust and efficient, to provide performance over a variety of tracks and conditions, requiring on-the-go modifiability and swappability. Other aspects to consider were cost-effectiveness and ease of manufacture, as the entire package was produced mostly in-house by the team, and multiple iterations for testing and racing would be required.

The wing was constructed from carbon fibre due to its lightness, with a S1223 aerofoil profile, which maximises downforce at low angles of attack, at the speeds over which the vehicle operates. A slot-screw system was used to secure the trailing edges of the aerofoil, which allows for rapid angle of attack adjustments, a crucial component of track specific setup.

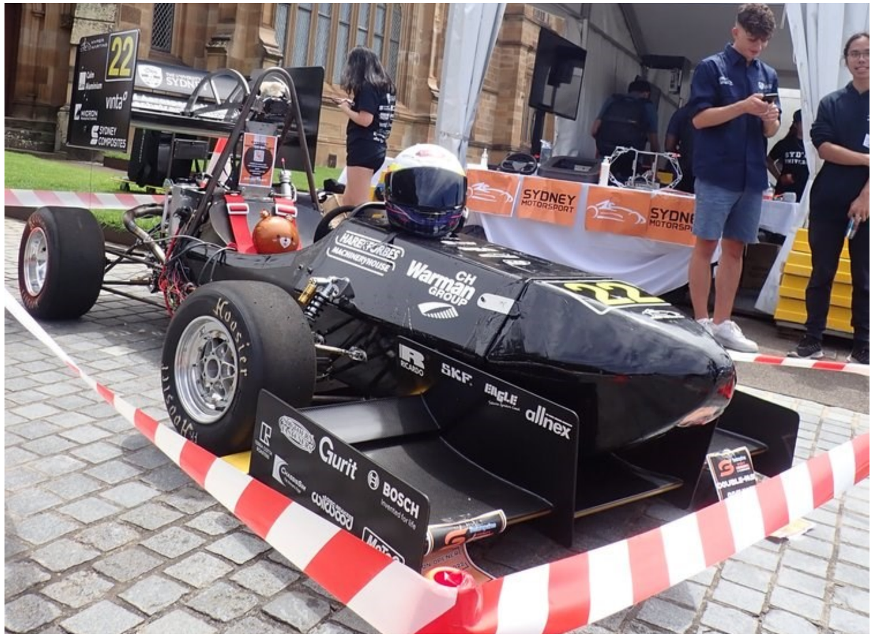
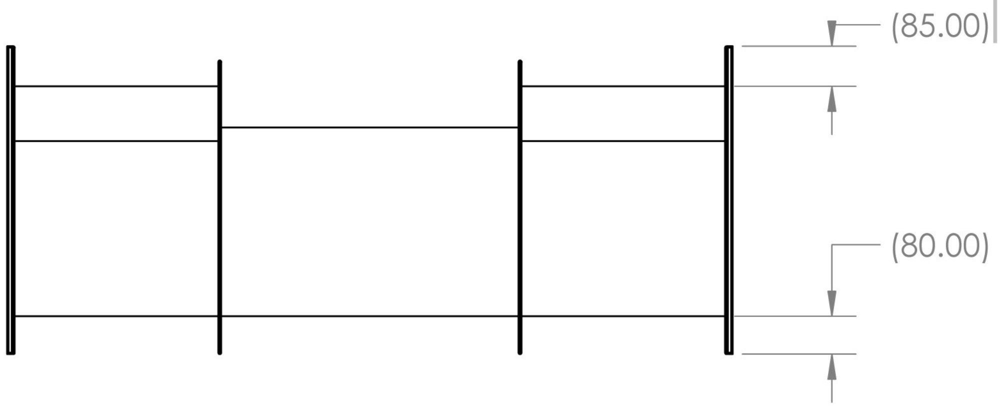
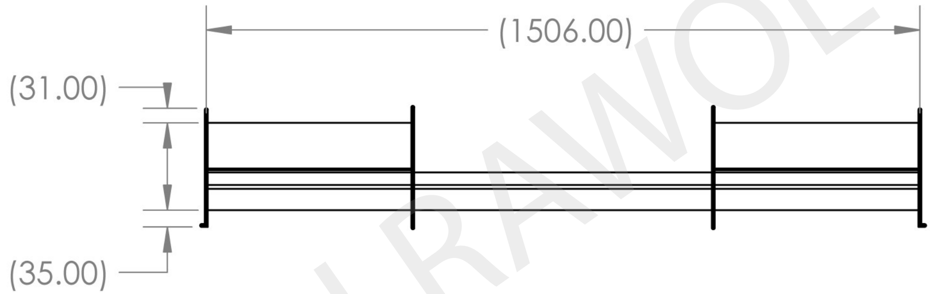
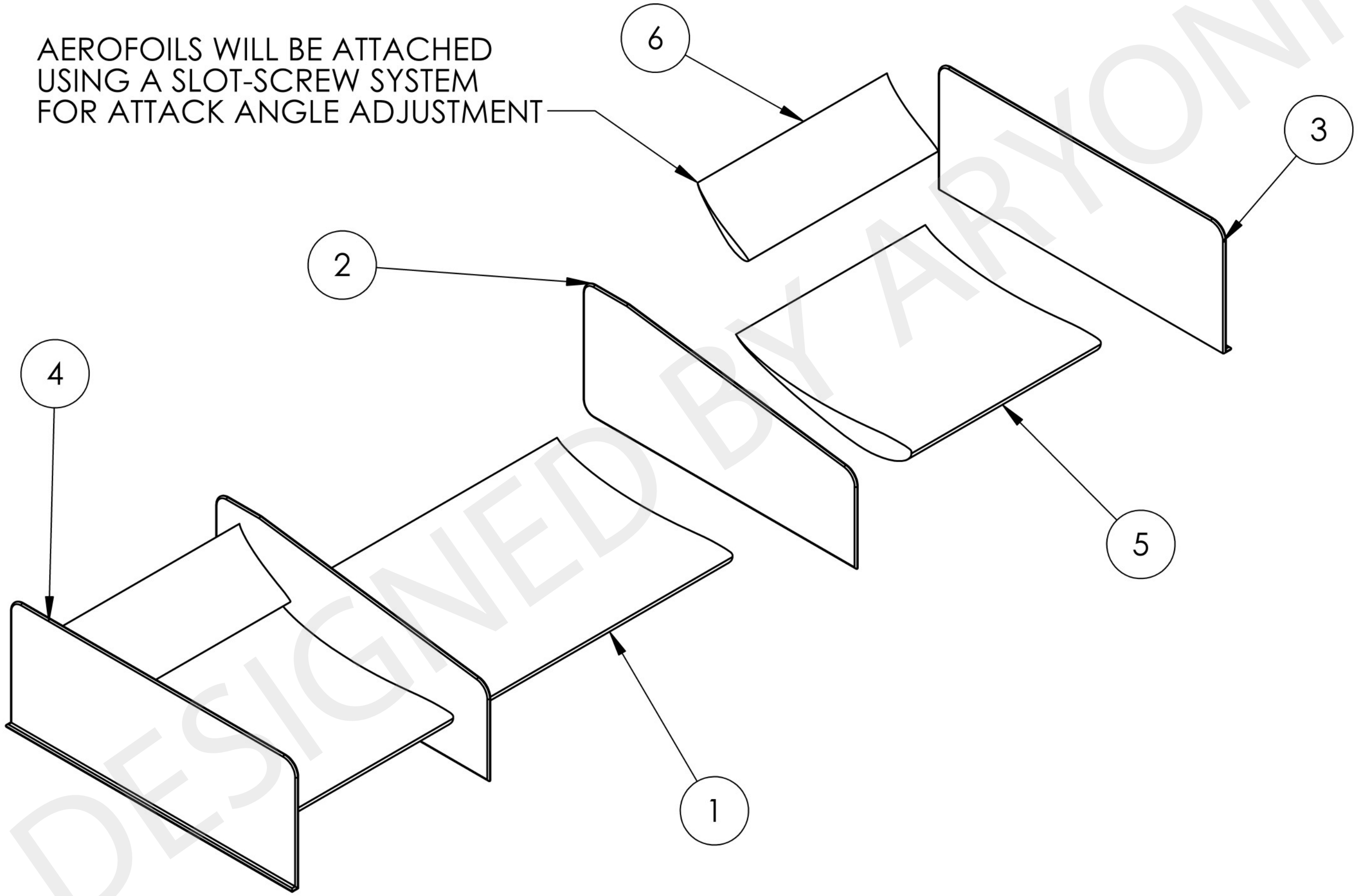


IMAGE BY SYDNEY MOTORSPORT





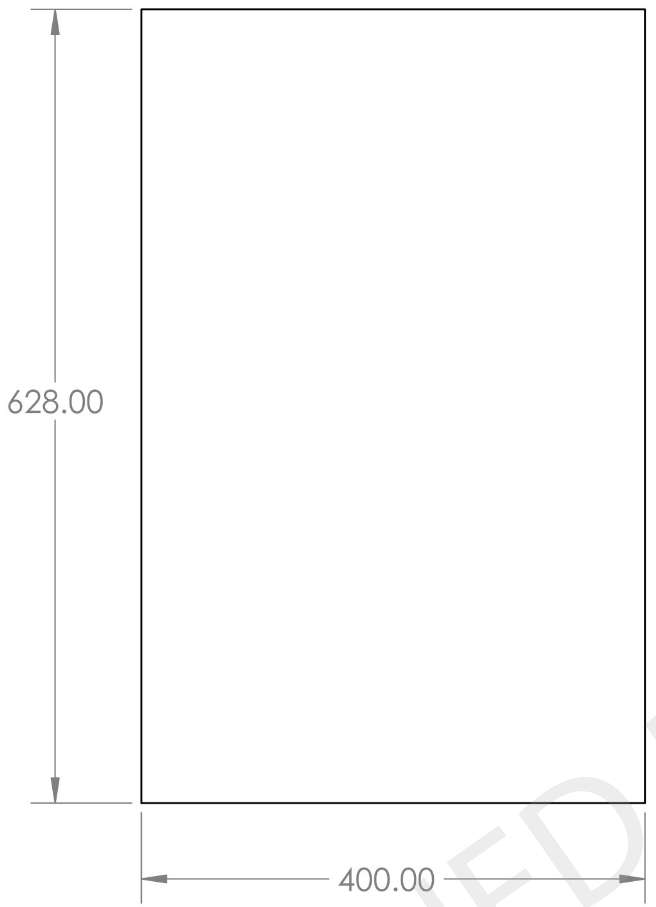


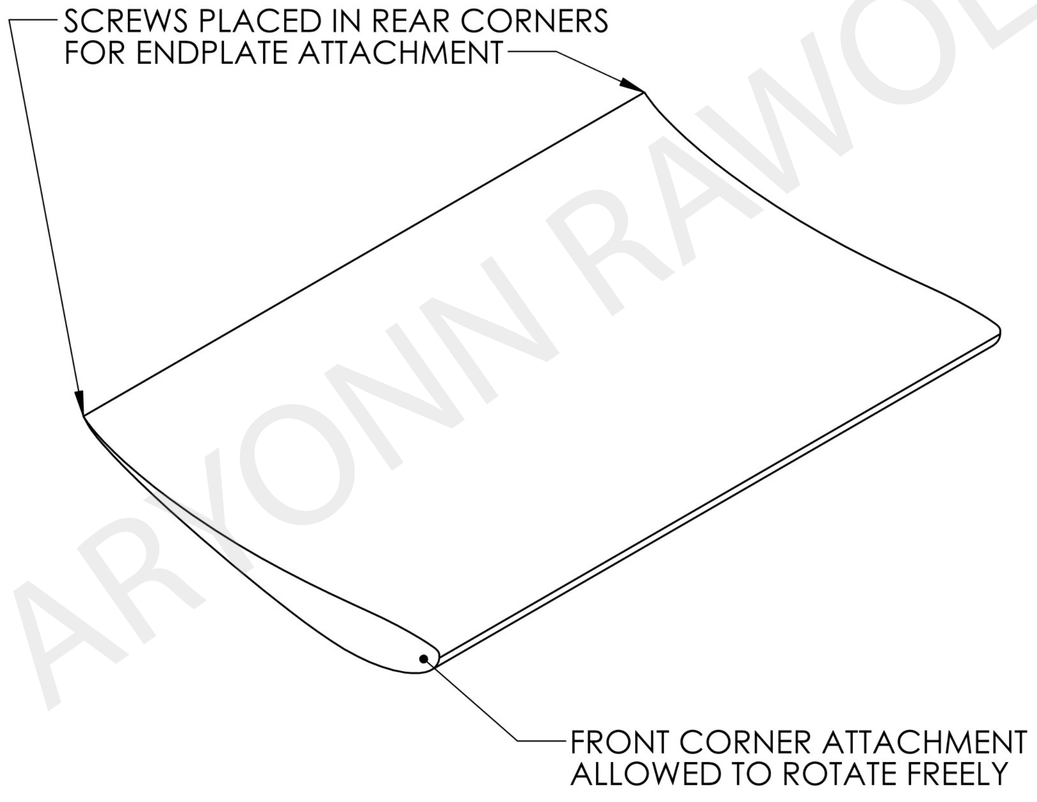
SCALE 1:12

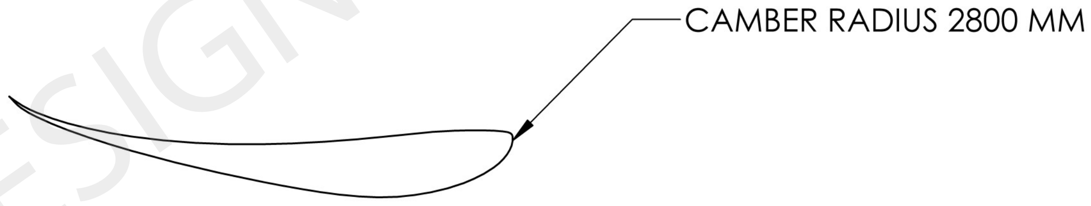
ITEM NO.	PART NO.	QTY.
1	CentreEle	1
2	Centreplate	2
3	LeftEndplate	1
4	RightEndplate	1
5	SideEle1	2
6	SideEle2	2

TITLE: FRONT WING ASSEMBLY	
ARYONN RAWOL	A4
SCALE:1:16	SHEET 1 OF 1

DESIGNED BY ARYONN RAWOL







NOTE: AEROFOIL PROFILE IS SELIG S1223-il

TITLE:

FRONT WING CENTER ELEMENT

ARYONN RAWOL

A4

SCALE:1:4

SHEET 1 OF 1

DESIGNED BY ARYONN RAWOL

FUEL TANK DESIGN

TASK

The task of this project was to meet stringent design guidelines for the production of a fuel tank for the 2020 USYD FSAE vehicle. Good fuel tank design is essential for the performance and safety of a race car. A properly designed fuel tank ensures that the fuel is delivered efficiently to the engine, while also maintaining a stable centre of gravity for the car. It also helps to prevent fuel leakage, which can be dangerous in the event of a crash or fire. In addition, a well-designed fuel tank minimizes the risk of fuel starvation, which can occur when the fuel supply is disrupted or runs out during a race. Proper fuel tank design is crucial for optimizing the performance of a race car and ensuring the safety of the driver and crew.

FEATURES

This fuel tank is designed with an Aluminium body for weight reduction, and has internal baffles to reduce fuel sloshing under high, varied acceleration loads. The shape is designed to fit under the driver seat cavity, locating it at the vehicles centre of gravity—reducing variation in handling performance as fuel level varies. The cradle construction uses high strength steel to endure the stresses of racing, with a three sided design for ease and speed of replacement, especially in pressure situations. All fittings are standardised with the rest of the vehicle, including hose lines and bolt attachments. Steel fasteners are used to reduce the risk of galvanic corrosion.

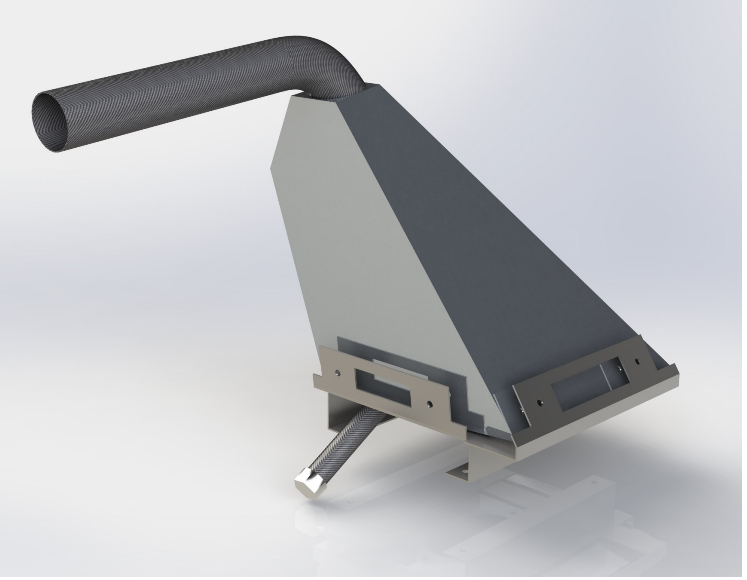


IMAGE BY ARYONN RAWOL

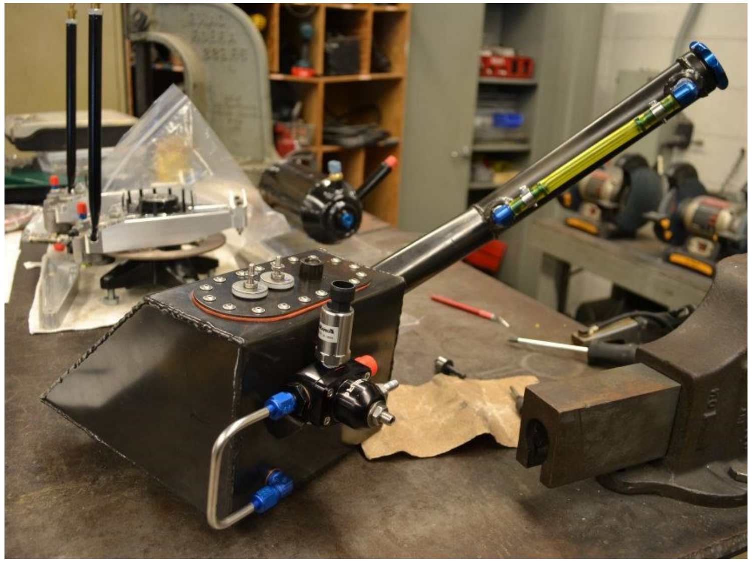
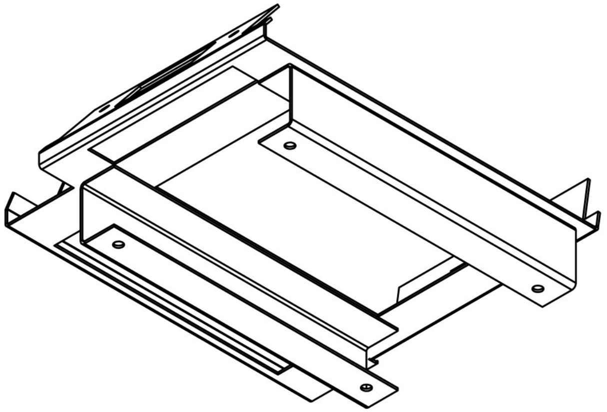
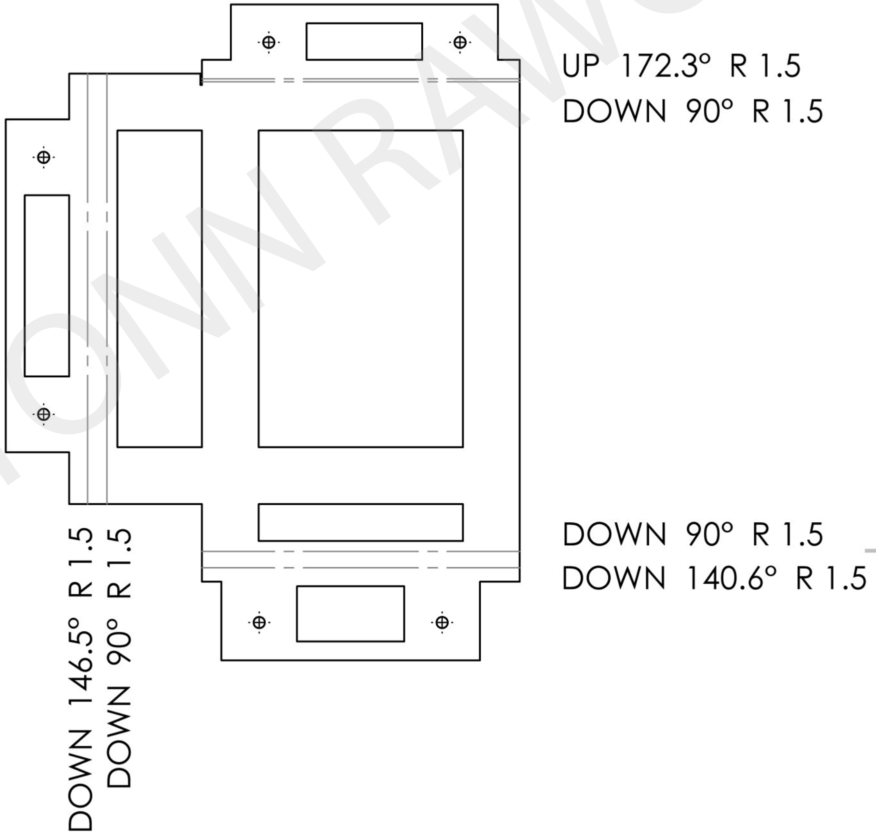


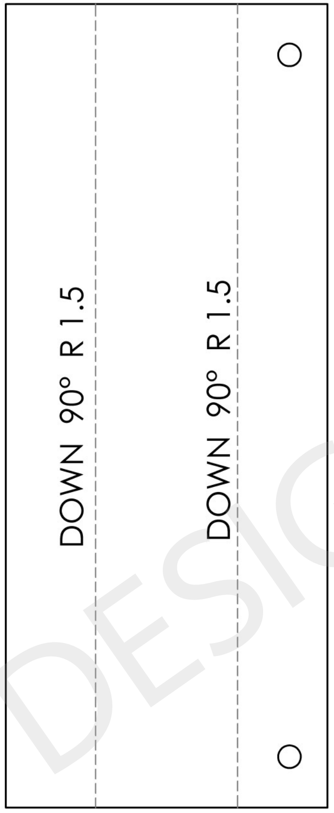
IMAGE BY ARYONN RAWOL

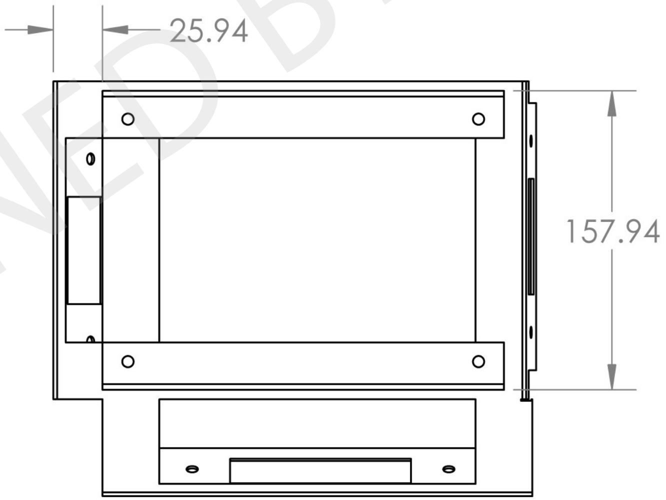


CRADLE BODY FLAT PATTERN



CRADLE MOUNT FLAT PATTERN





NOTE: SEE PART DRAWINGS FOR SHEET DIMENSIONS

TITLE: CRADLE ASSEMBLY	
ARYONN RAWOL	A4
SCALE:1:4	SHEET 1 OF 1

DESIGNED BY ARYONN RAWOL

NOSECONE DESIGN

TASK

One of my tasks in the rocketry team was to help design a nosecone structure for the Firetail rocket. The nosecone of a rocket serves a number of important purposes. It is the very front of the rocket and is designed to streamline the shape of the vehicle, reducing drag and allowing it to travel more efficiently through the air. In addition, the nosecone protects the sensitive electronics and other equipment located at the front of the rocket during the launch and ascent phases. Finally, the nosecone may also house scientific instruments or other payloads that are being carried by the rocket. Overall, the nosecone is a crucial component of a rocket and plays a vital role in the success of any space mission.

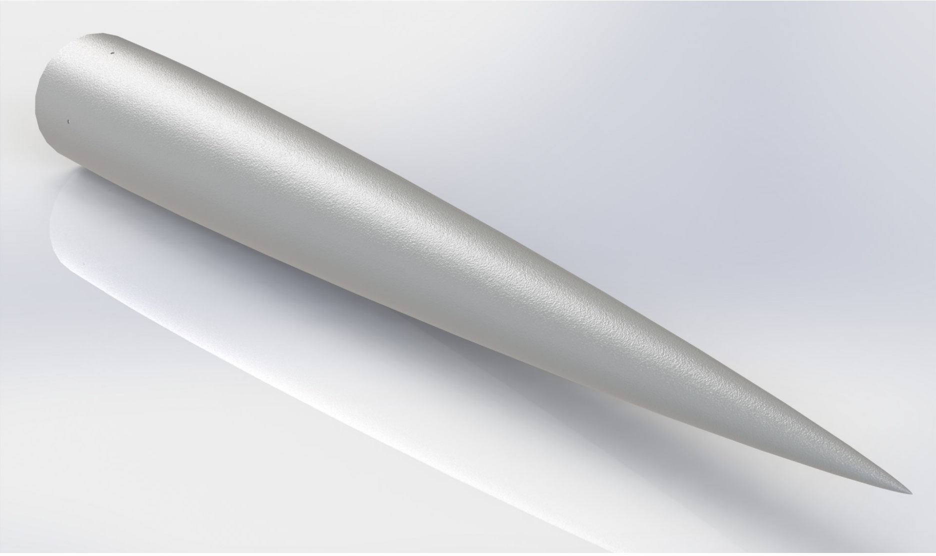
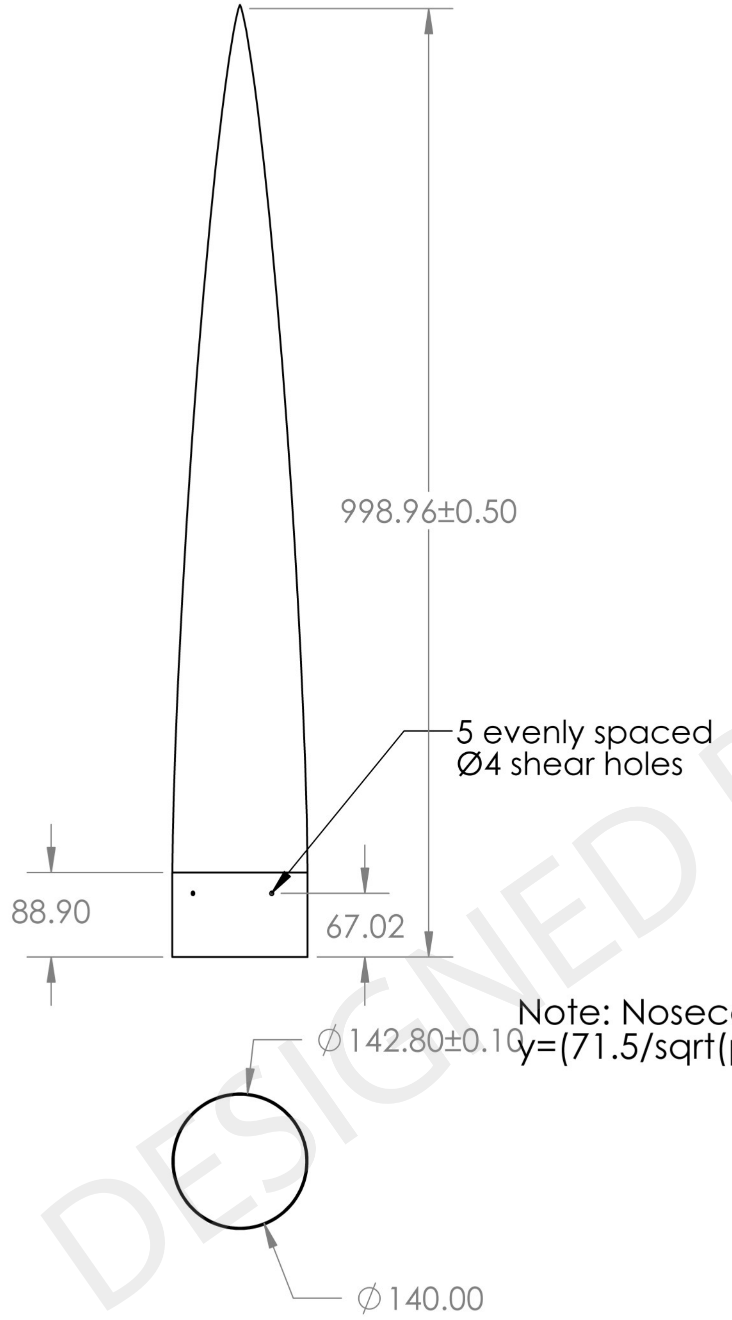


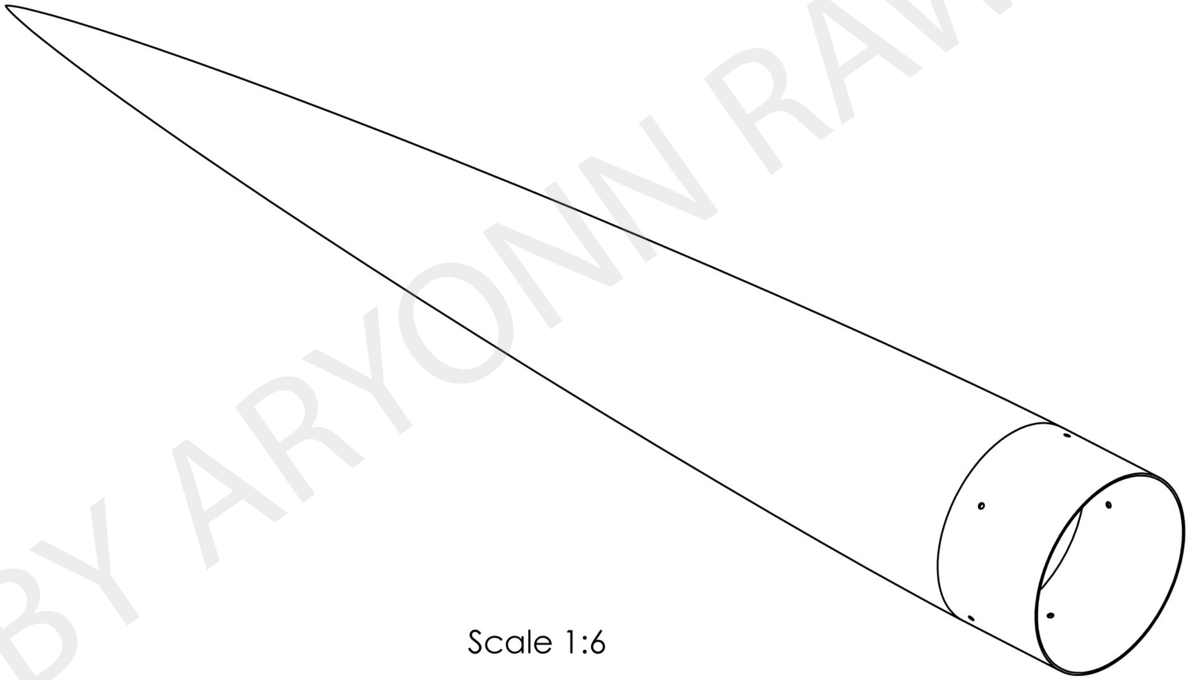
IMAGE BY ARYONN RAWOL

AIM

The nosecone needed to be designed for three main constraints: the shape needed to minimise drag on the rocket, be able to hold sensor and telemetry equipment, and allow for radio frequency signals to pass through unimpeded. For nosecone shape, the Von-Karman Haack (a mathematically derived curve) design was used to minimise drag for a given length and rocket diameter. The length was selected based around the telemetry team module design, with a fibreglass construction to minimise RF distortion.

IMAGE BY USYD ROCKETRY



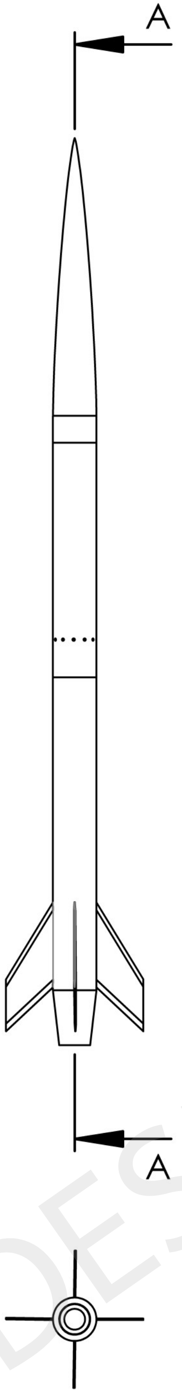


Scale 1:6

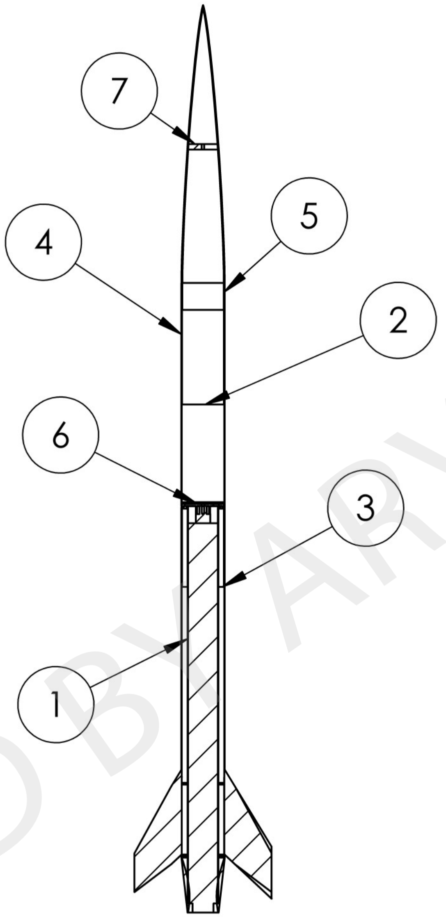
Note: Nosecone outer curve was created using Von Karman Haack Series, with equation:
y=(71.5/sqrt(pi))*sqrt(arccos(1-2*(x/914))-0.5*sin(2*arccos(1-2*(x/914)))), x range (0,914)

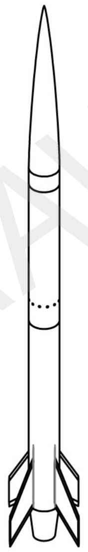
DRAFTING STANDARD: AS1100	ARYONN RAWOL	USYD ROCKETRY TEAM
	CHKD M.J.B 28.01.2020	TITLE: NOSECONE
MATERIAL: FIBREGLASS	APPVD M.D 28.01.2020	
	ISSUED M.D 28.01.2020	
FINISH: SANDED SMOOTH, CLEAR COAT	UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS OR DEGREES TOLERANCES: LINEAR: 0.2 ANGULAR: 0.1	SIZE A4 / DWG NO. NC003
		SCALE:1:8 / SHEET 1 OF 1

DESIGNED BY ARYONN RAWOL



SECTION A-A
SCALE 1 : 25





ITEM NO.	PART NUMBER	QTY.
1	V001_Rear_Assembly	1
2	V001_Forward_Coupler	1
3	V001_Tube_Coupler	1
4	V002_Forward_Airframe	1
5	V002_Nosecone	1
6	V002_Forward_Retension_Bulkhead	1
7	V001_Nose_Cone_Bulkhead	1

UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS OR DEGREES TOLERANCES: LINEAR: 0.1 ANGULAR: 0.1	ARYONN RAWOL CHKD M.W.L.G. 07.03.19 APPVD A.F.B 14.03.19 ISSUED A.F.B 18.03.19	USYD ROCKETRY TEAM TITLE: FULL ASSEMBLY
FINISH: VARIOUS	DRAFTING STANDARD: AS1100	SIZE A4 · DWG NO. FA001 SCALE:1:25 · SHEET 1 OF 1

DESIGNED BY ARYONN RAWOL

FIN POSITIONING SYSTEM

CONCEPT

The Australian University Rocketry Challenge is an annual competition that invites teams from universities around the world to design, build, and launch rockets. The goal of the challenge is to encourage students to pursue careers in the field of rocket science and to promote innovation in rocket technology. Teams must design and build a rocket that meets specific requirements, such as reaching a certain altitude or carrying a payload, and then launch it successfully. The winning team is chosen based on the performance of their rocket, as well as their presentation and overall project management.

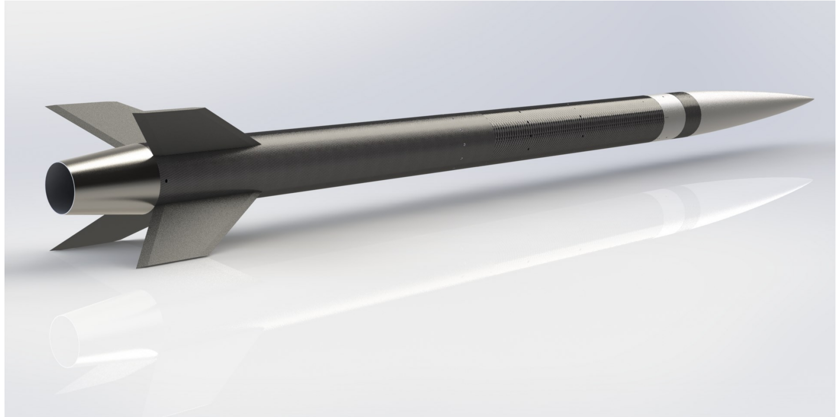


IMAGE BY ARYONN RAWOL

AIM

My first major task for the USYD rocketry team was to design a fin positioning system for the Firetail 30 000 ft rocket. The main goals of the system were lightweightness—important on any airborne craft; ease of production and service—it had to be serviceable on a quick turnaround by student engineers at a flight range; robustness—surviving ground impact and the rigors of rocket flight; and cost effectiveness—for replacement when it didn't. A balsa ring and groove system was selected, designed to sit around the motor casing, and snap in the event of failure to protect the more expensive fins, which were laid carbon fibre, and tolerance for stable spaceflight.

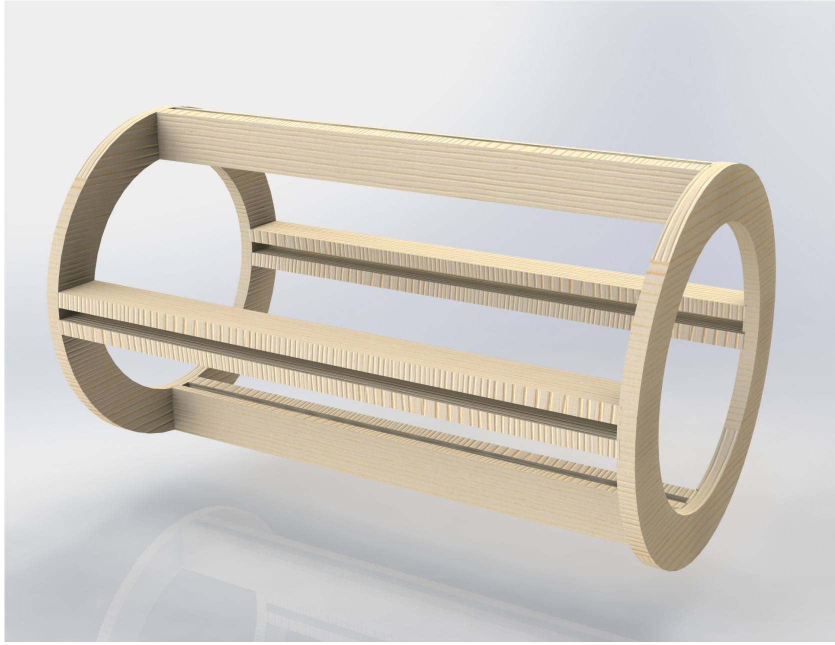
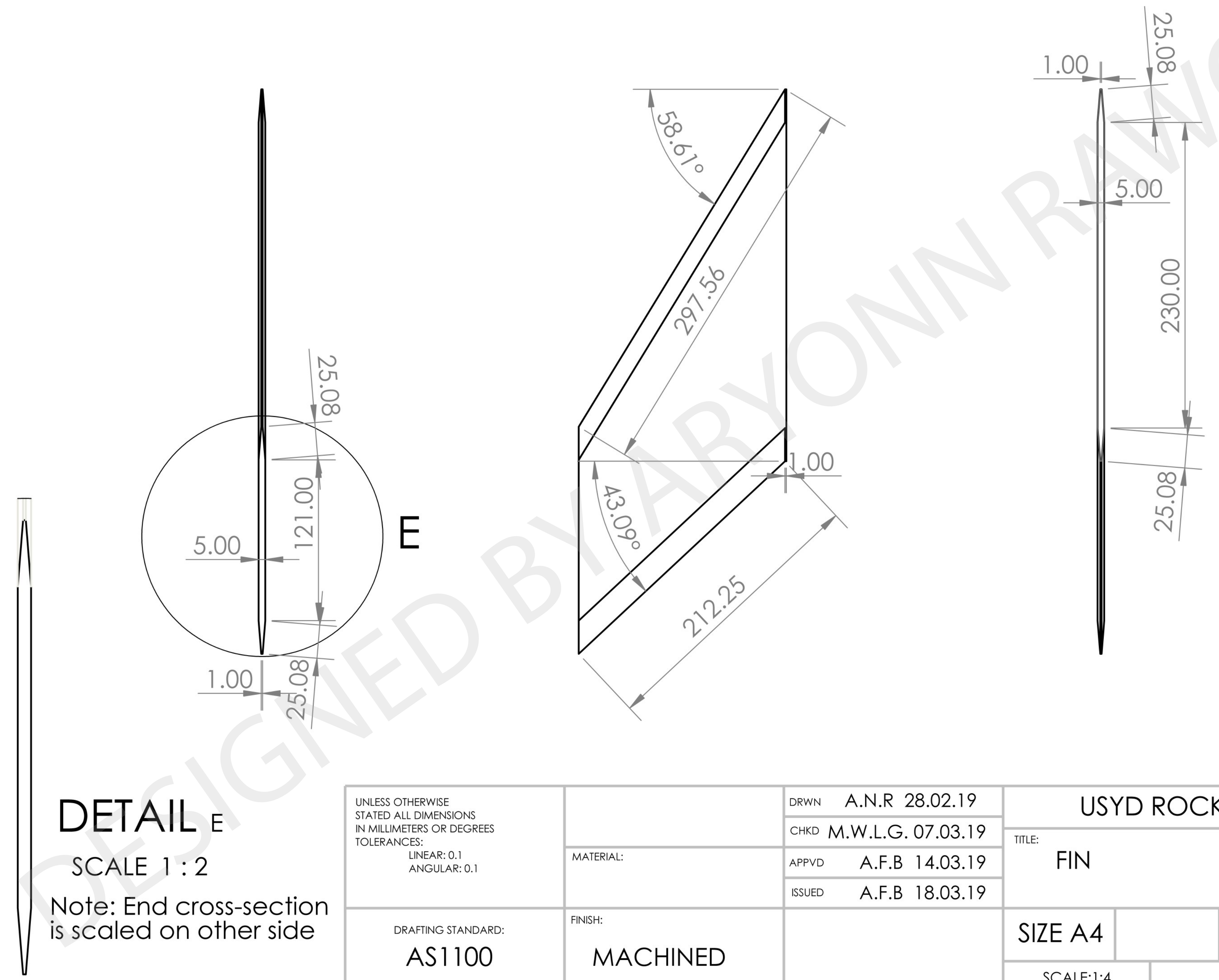


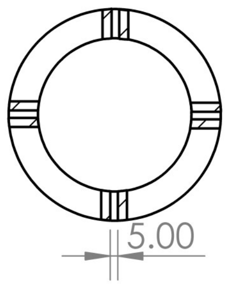
IMAGE BY ARYONN RAWOL

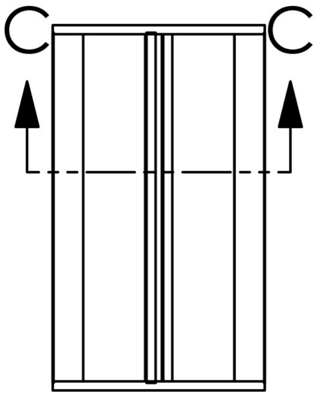


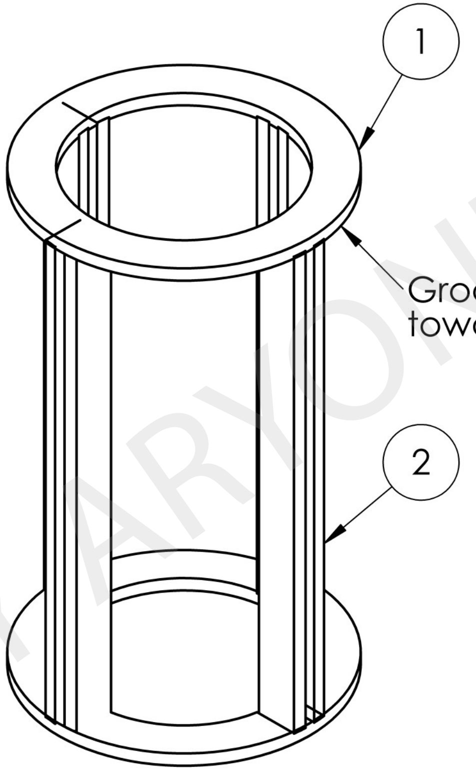
UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS OR DEGREES TOLERANCES: LINEAR: 0.1 ANGULAR: 0.1	MATERIAL:	DRWN A.N.R 28.02.19 CHKD M.W.L.G. 07.03.19 APPVD A.F.B 14.03.19 ISSUED A.F.B 18.03.19	USYD ROCKETRY TEAM TITLE: FIN
DRAFTING STANDARD: AS1100	FINISH: MACHINED		SIZE A4 / DWG NO. F001 SCALE:1:4 / SHEET 1 OF 1

DESIGNED BY ARYONN RAWOL

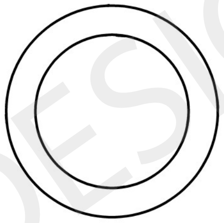
SECTION C-C







Grooved side facing inwards towards Fin Tabs



Note: More details can be found in the drawings for individual parts

ITEM NO.	PART NUMBER	QTY.
1	V001_Fin_Centering_Ring	2
2	V002_Fin_Tab	8

UNLESS OTHERWISE STATED ALL DIMENSIONS IN MILLIMETERS OR DEGREES TOLERANCES: LINEAR: 0.1 ANGULAR: 0.1	MATERIAL:	DRWN A.N.R 28.02.19 CHKD M.W.L.G. 07.03.19 APPVD A.F.B 14.03.19 ISSUED A.F.B 18.03.19	USYD ROCKETRY TEAM TITLE: FIN POSITION ASSEMBLY
DRAFTING STANDARD: AS1100	FINISH: MACHINED AND GLUED		SIZE A4 / DWG NO. FP001 SCALE:1:2 / SHEET 1 OF 1

DESIGNED BY ARYONN RAWOL

THANK YOU

ARYONN RAWOL